EFI STM abstract: dr. Luka Krajnc (Slovenian Forestry Institute, Slovenia) visiting CETEMAS, Spain

Calibration of resistance-drilling density with X-ray microdensitometry

Resistance drilling is becoming more frequently used in assessing the quality of standing trees over the last couple of years. It is a fast, relatively non-destructive method, which collects a large amount of data in a short time frame. However, the radial density profiles obtained by drilling are directly not useful for assessing absolute wood density. Due to the nature of resistance drilling, the obtained radial density profiles are relative and need to be calibrated against actual wood density values. This can be done in multiple ways, one of them is to compare resistance drilling density to densities obtained by using X-ray. Those are usually performed on increment cores, which results in actual density profiles. X-ray wood density can therefore be used to calibrate the values of resistance drilling density. The calibration curves presumably differ between tree species and are also likely to be affected by tree size.

The main objective of my STM is to calibrate resistance drilling measurements using X-ray microdensitometry. This will be done by comparing resistance drilling density with density profiles obtained by using X-ray densitometry on increment cores. A sample of 90 trees will be drilled using the Resistograph in the summer of 2020. Increment cores will also be extracted from the same trees and then transported to the host institution in advance of the STSM. Trees of European beech (*Fagus sylvatic*a L.), Norway spruce (*Picea abies* (L.) H. Karst) and silver fir (*Abies alba* Mill.) will be included in the study, since they are important for timber production in Slovenia and Europe. The secondary objective is to establish a fruitful and long-term collaboration between the two involved institutions.

At the beginning of the STM, the cores will be prepared for X-ray microdensitometry using a twin bladed saw at the host institution. The samples will then be scanned using the X-ray and the data analyzed. Sample preparation will take approximately a week, X-ray scanning two weeks and the analysis one week. I would be involved in all stages of the calibration, from sample preparation to data analysis.

The host institution is already in the process of collecting samples of two pine species to perform the density calibration in those species. They expect to have the samples collected by August 2020, which would mean we could do the calibration for my three species and their two species simultaneously. As we would combine knowledge, the process would be more efficient.

During my stay at the host institution I will also present my current work to the researchers employed by the host institution. The presentation will also include the challenges I deal with when researching wood properties and timber quality. Hopefully, an interesting discussion will develop afterwards, from which new ideas and approaches will evolve. These should hopefully end with a joint research project proposal (ERC, Horizon Europe) sometime in the next two years.

The STM will result in at least one publication regarding the calibration process and results in a high-ranking peer-reviewed journal, which will also be presented in at least one scientific conference. The calibration values for each species will also be incorporated into an R package for analysis of resistance drilling densities from standing trees, which is currently being developed at Slovenian Forestry Institute.